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ABSTRACT

The invention concerns an image transmission system applied to the driving of railway vehicles and convoys characterised in that there are a set of one or more cameras, whether adjustable or not, variable focal or fixed; one or more screens, potentially showing a general view or a detailed view, the general view screen potentially being of the touch-screen type, as well as possibly one or more video recorders, this set or some part of it only being potentially displaced to the interior of the locomotive vehicle or of the train or placed in a detachable module.

PATENT APPLICATION

Imagery transmission system applied to the driving of railway vehicles and trains.

PREAMBLE

The substitution of a view based on optical or electronic means for a direct view of the rails constitutes a new economic, technical and human response to the driving of railway vehicles and trains. This is what is proposed by the present invention.

It will permit substantial economies in the modernisation or construction of rolling stock.

It will facilitate the utilisation of the network by enabling the driver in some cases to avoid having to change cabs when the train reaches its terminus and by facilitating the setting back of the train in stations, especially at the end of the line.

It will increase the safety of the driver.

STATE OF THE ART

Previously in the art, driving was done by means of direct view from a cab situated most often at the front of the train. In the case of a non-separable electric train, there must be a cab at each end; in the case of a locomotive, there must be a cab at each end of the locomotive; and if a locomotive pulls or pushes a so-called reversible train, there must be a third cab at the end of the train for those times when the locomotive is at the rear.

There are cases where only a single cab is necessary. The most common example is that of the locomotives built in the United States, where the cab extends sideways from the body of the locomotive and gives, besides the view to one side, a certain view to the front and rear. Another example is that of a certain series of railway cars used in the past by the SNCF (French national railway company), where the driver's station was higher than the roof and therefore benefited from a panoramic view, or yet that of certain locomotives where the cab occupies a central elevated position.

The previous art has disadvantages. In the case where each cab is specialised for one driving direction, a first disadvantage is economic and comes from the cost of multiple cabs; a second disadvantage concerns the utilisation when the train is "reversed" (that is, when the train departs in the opposite direction from its previous journey): this is linked to the time taken by the engine driver to shut down one cab, move to another cab and start it up. The time taken may lead to an increase in the number of trains necessary to ensure a certain fluidity. Another disadvantage concerns setting back a train without a cab at both ends in order to bring it to the platform at an end-of-the-line station. For security reasons a second crew member is generally required to carry out the manoeuvre, in radio contact with the engine driver situated at the other end.

The disadvantage of a single driving cab situated on one side, apart from the fact that the field of vision is still limited, is that, in order for the cab to extend beyond the width of the train, the train's overall size must be reduced and the view towards the far end of the train is limited. As far as a cab extending above the roof is concerned, the disadvantages are that such an extension is not possible if the car's dimensions are close to the maximum dimensions permitted, that it has a negative effect on aerodynamism and further that signal lights placed at ground level are only visible from a distance since the roof extends further forward than the cab.

The aim of the invention is to reduce the overall cost of driving cabs by reducing the number required on the one hand, and to allow driving in both directions to be carried out from the same cab on the other.

The object of the invention is a cab transmission system using camera equipment, transmission equipment, generally via cable but possibly having recourse to a radio or optical link, and display equipment in front of the engine driver.

The principle of remote electronic imagery is known.

The patent FR.2.677.833 which relates to a television surveillance installation describes a system consisting of:

a first position comprising a video camera and a slow scan television emitter,

a second position comprising a slow scan television receiver and a monitor linked to the output of this receptor. These positions, at least one of which is mobile, also comprise the respective linking means appropriate to allow them to communicate

with each other by way of a pre-existing telecommunications system which includes the public telephone network and at least one mobile radio-type linking means.

The described embodiment is particularly intended for remote surveillance of resources and moving objects in cases where the emitter cannot be linked to a normal telephone line (truck, armour-plated van, detection of landslides, etc...).

Another embodiment according to FR 2.677.833 is characterised in that the first and second positions are both mobile and each comprise a camera linked to a slow scan emitter, and a monitor linked to a slow scan receiver, emitter and receiver being coupled to a radio terminal appropriate for emitting or receiving signals to or from a telephone network.

DESCRIPTION OF THE INVENTION

The invention is best understood by reading a preferred method of embodiment and certain variants of this method, which are indicated solely in order to illustrate the invention and which in no way reduce its scope.

The description of this preferred method is based on the following figures:

- Figure 1 gives a general diagram of the transmission of the driving cab,
- Figure 2 shows a configuration for use in place,
- Figure 3 shows a configuration for use in an existing locomotive,
- Figure 4 shows a configuration in a locomotive built in expectation of the use of a transmission such as is described in the invention,
- Figure 5 represents a configuration in a electric train built in expectation of the use of a transmission such as is described in the invention.

In Figure 1 may be seen a set of cameras C. Each of them is adjustable and variable focal. At a given moment, the camera C1 is assigned to a shot of the general view with quite a short focus, camera C2 is assigned to a shot of a detail, with quite a long focus and camera C3 is held in reserve to substitute for one or other of the cameras in case of breakdown. Their roles are interchangeable. The cameras can be equipped with a colour temperature measuring device, in order to adapt quickly to changes in lighting (tunnel, night, etc...).

In the driving cab may be seen two superposed screens, for example in 16/9 format. The first shows the general view and the second shows a detailed view. The screen showing the general view is a touch screen. If the engine driver moves his/her

finger across it, the direction and the focus of the camera giving the detailed view will adapt so that all the points indicated will show on the second screen, with the longest focus possible. Optionally, an image processing system working by correlation between successive images modifies the pointing of the camera giving the detailed view so that the centre of the image does not move. The intention is to be able to follow one point in particular, for example a signal head, while the train progresses.

The invention also comprises optionally the following ameliorations:

- A colour analysis system which seeks out the zones where the colour is close to colours predefined as being those of signal lights (green, yellow, red and violet). It highlights on one or other of the screens the zones recognised as containing these colours. It only does so in response to an express command by the engine driver.
- An inlay device in the image allows the appearance of alarms or various messages, including pictograms.
- A signal provided by one or more cameras is saved on videotape in order to complement the driving information recorder ("black box") and to give information on the moments preceding a possible collision. The recording is permanent but can be wiped when the reason for recording it is no longer useful. It can be carried out by replacing the camera-video recorder sets with camcorders.

Different configurations of use of this image transmission can be imagined.

Figure 2 represents a local usage, in which the screens are to be found in immediate proximity to the cameras. The aim of this configuration is to allow a better view, particularly as a result of the detailed views but also by a better adaptation to the visibility conditions and by better protection against staining, using for example a turning porthole in front of the cameras, a deflector, or a laser beam, and to allow the messages to be inset and saved.

Figure 3 represents an existing locomotive in which the cameras have been placed in or in front of one of the cabs and the screens in the other, the image transmission realised for example by a fibre optic cable. The aim is, when an existing locomotive is modernised, only to modernise a single cab.

Figure 4 represents a new locomotive, equipped with a single driving cab. The aim, besides saving space and weight, is to place this cab in a location which will

ensure the best possible protection for the engine driver in case of impact, for example at the centre of the locomotive.

Figure 5 represents a new electric train, also equipped with a single cab. The cab may this time be placed anywhere on the train. The aim is to allow the engine driver to avoid changing places when the train turns round. If the electric element must be coupled to another electric element to increase capacity, as is often the case with suburban trains or high speed trains (TGVs), the linkage between the elements may make use of an optical, coaxial, or hyper-frequency connection. This is equally true for classic trains composed of one or more locomotives and cars, vans or trucks.

The preferred method of embodiment described is intended solely to facilitate understanding of the invention and in no way limits its scope. Those skilled in the art may modify one or other modality of embodiment without departing from the field of the invention.

CLAIMS

1. Image transmission system applied to the driving of railway vehicles and convoys characterised in that there are a set of one or more cameras, whether adjustable or not, variable focal or fixed, one or more screens, the first or only of which shows a general view and in the case of more than one screen, the second showing a detailed view, the general view screen potentially being of the touch-screen type, as well as possibly one or more video recorders.

2. System according to claim 1 in which camera C1 is involved in capturing a general view of the rails with a short focus, camera C2 is involved in capturing details with a long focus, camera C3 is held in reserve in order to substitute for one or other of the cameras C1 and C2 in case of failure, these three cameras being polyvalent, interchangeable, optionally adjustable and optionally equipped with a colour temperature measuring device in order to be able to adapt rapidly to changes in the light of day or night, of progression through bare countryside, in built-up areas, or through tunnels.

3. System according to claim 1 in which the orientation and the focus of the camera giving the detailed view adapt so that all the points shown on the first screen may also appear on the second screen with the longest focus possible.

4. Device according to claims 1 and 2 additionally equipped with an image treatment system working by correlation between images at different moments for example with successive images and modifying the angle of the camera giving the detailed view.

5. System according to claims 1, 2, 3 and 4, in which separate cameras and video recorders are replaced by camcorders.

6. System according to claim 1, incorporating a colour analysis system which seeks out the zones where the colour is close to the colours predefined as being those of signal lights.

7. System according to claims 1, 2 and 3 in which the screens are in immediate proximity to the cameras.

8. System according to claims 1, 2, and 3 in which the screens are displaced from the cameras and are linked by metallic or fibre optic cable.

9. System according to claim 1 characterised in that at least one camera-video recorder pair is replaced by one or more camcorders.

10. System characterised by a set of two cameras, two screens and a camcorder.

11. System according to claim 1 characterised in that there is a set of two camcorders and two screens.

12. System according to claim 1 characterised in that there is a set comprising a camcorder, a camera, a video recorder and two screens.

13. System according to claim 1 in which the displaced cabin may be formed of a detachable module.

14. System according to any of the claims 1 to 13 in which the image transmission is carried out by means of a fibre optic cable.

15. System according to any of the claims 1 to 13 in which the image transmission is carried out by coaxial link.

16. System according to any of the claims 1 to 13 in which all or part of the link between cameras and screens is carried out in hyper-frequencies.